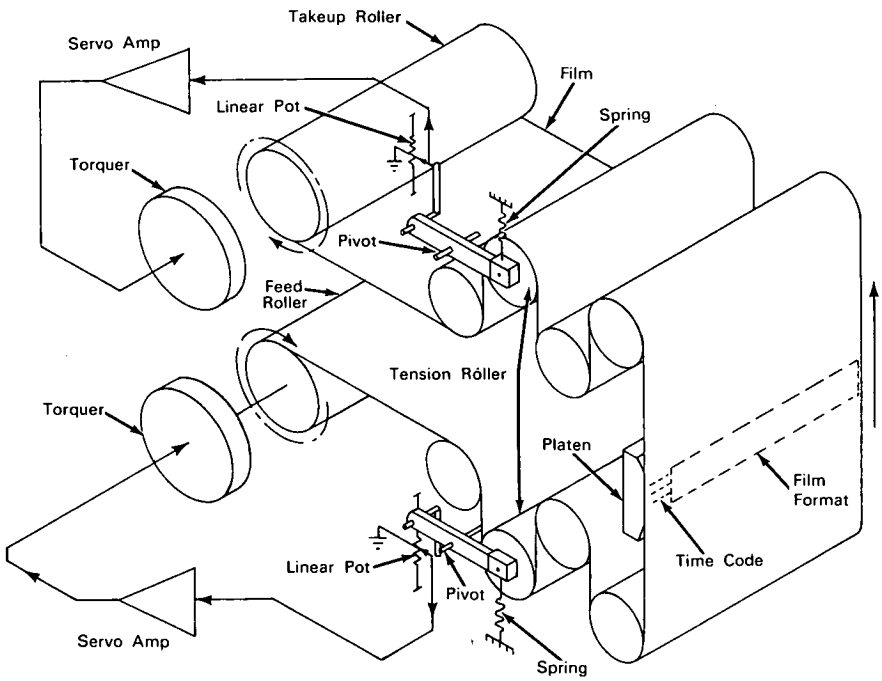
NASA TECH BRIEF

Tension Is Servo Controlled in Film Advance System



The problem: The tension of material such as film in a roller advance system may vary due to mechanical disturbances, stopping and starting torques, and material irregularities. Tension changes beyond certain limits result in system degradation or complete stoppage.

The solution: A servo-controlled system in which film tension changes are immediately sensed and corrective torque changes made to drive and/or take-up elements.

How it's done: A two-servo system incorporating two center-tapped linear potentiometers is coupled through pivoting arms to two corresponding spring-loaded tension rollers in the film advance system. The potentiometer center taps are grounded. Spring tension on the tension rollers is preset to provide a balanced film tension across the film loop. In this mode the potentiometer wipers are at ground potential and no error signals are applied to the servo amplifiers. If slack appears on the feed side of the film loop, the tension roller is pulled down by the spring and a negative signal from the potentiometer is fed to the amplifier. The amplified negative signal drives the feed roller torque motor in reverse to take up the slack. As the slack is decreased, the tension

(continued overleaf)

roller moves toward its normal position and the potentiometer wiper moves toward the null (ground potential) position where the error signal ceases. If too much tension appears across the feed side of the film loop, a positive error signal is generated in the potentiometer and the feed roller is torqued in the forward direction to add more slack to the loop and return the potentiometer to a no signal condition. In the takeup side of the film loop the servo action is identical but opposite in polarity. Slack provides a positive (forward) signal to the servo loop, while too much tension results in a negative (reverse) signal.

Notes:

1. This system would have application wherever continuous material is transported under tension from one storage element to another. Examples are paper mills, newspaper presses, metal strip and wire plants, and textile mills.
2. Where desirable, differing torques could be maintained at points in a transport loop.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Langley Research Center
   Langley Station
   Hampton, Virginia, 23365
   Reference: B65-10075

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: American Optical Company
under contract to Langley Research Center
(Langley-54)